GARDEN AND FOREST.

PUBLISHED WEEKLY BY

THE GARDEN AND FOREST PUBLISHING CO.

OFFICE: TRIBUNE BUILDING, NEW YORK.

Conducted by . . . . . Professor C. S. SARGENT.

ENTERED AS SECOND-CLASS MATTER AT THE POST OFFICE AT NEW YORK, N. Y.

NEW YORK, WEDNESDAY, JANUARY 2, 1889.

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The Influence of Mountain Forests.

THE following paragraph appears in a paper recently read by Mr. Henry Gannett, Geographer of the United States Geological Survey, before the Philosophical Society of Washington:

"Although forests have no influence upon precipitation, yet they do exert a certain economic influence. Without increasing rainfall, they, in common with other forms of vegetation, economize that which falls, retaining it somewhat as a reservoir, and preventing its rapid descent into streams. In this way, too, forests tend to reduce the magnitude of floods and to regulate the flow of rivers, thus preventing disaster and improving navigation. This retention of the rainfall is, however, accompanied by a rapid evaporation from the leaf surface of the forest, whereby a considerable proportion of the rainfall returns to the atmosphere without reaching the earth. On this account it is urged, and I think with reason, that in our arid region, which is dependent for irrigation upon its streams, it is advisable to cut away as rapidly as possible all the forests, especially upon the mountains, where most of the rain falls, in order that as much of the precipitation as possible may be collected in the streams. This will cause, not a decrease in the annual flow of the streams, as commonly supposed, but an increase, coupled with a greater concentration of the flow in the spring months, and result in rendering fertile a greater area of the arid region. It may be added that the forests in the arid region are thus disappearing with commendable rapidity."

There are two reasons why Mr. Gannett's sweeping denial of the value of mountain forests cannot be accepted. In the first place, the fact is still to be demonstrated that the expiration from the leaves of trees exceeds in volume the evaporation from the unprotected surface of the ground stripped of the same trees, the evaporation, of course, increasing in proportion to the dryness of the atmosphere. The truth of Mr. Gannett's statement can only be proved by measuring the total annual flow of two streams with water-sheds of similar extent and contour, and influenced by precisely similar climatic conditions, one cleared and the other forest-covered. Such a record, we believe, has never been kept. But until such a method is adopted to demonstrate the soundness of his views, it is prudent to hold to the well-established fact that the evaporation from the surface of cleared land largely exceeds that from ground covered with forests.

The increased flow of streams, during the early spring months, must be stored in artificial reservoirs, constructed at no great distance from their sources, if the clearing of the mountain sides is to result "in rendering more fertile a greater area of the arid region," or the flow of water, whether it is increased or diminished by the destruction of the forests, will have passed away before it is needed for purposes of irrigation. Artificial reservoirs for the storage, for subsequent use, of the spring flow of rivers in mountain regions, can be made, under some circumstances, valuable adjuncts to the natural reservoirs existing in forest-covered water-sheds. But there are two serious objections to them. Water stored in this way is subject to enormous evaporation, which increases in proportion as it is most needed—a fact which may be expected to seriously affect the value of any system of irrigation in our arid western territories, based solely upon the use of artificial reservoirs. The danger, too, that such reservoirs, however solidly they are constructed, may be carried away during periods of exceptional floods, is very great; and the danger increases with the spring flow of the river, which, as Mr. Gannett points out, is concentrated at that season in proportion as the water-shed is deprived of its natural covering. An artificial reservoir at the head of a stream is always a danger and a menace to the people living below it; and while such reservoirs will no doubt have to be built in several places if the arid west is ever to be redeemed by irrigation in any comprehensive way, it will be simply folly to throw away, by allowing the forests to be destroyed, the opportunity of reducing this danger to a minimum.

The Yosemite Valley.

THE press of California is at last thoroughly aroused to the importance of reorganizing the Board of Yosemite Commissioners, who, if all the stories told about them are true, are about as undesirable a body of officials as can be found in California or any other state.

The territory in which the valley is situated was conveyed several years ago by the National Government to the State of California to be held as a public park, that its natural features might be preserved for the use and enjoyment of the people of the United States. The character of the Yosemite scenery is bold and striking; and its value for those purposes for which the park was created may be increased or diminished in proportion as the minor natural features of this scenery are maintained or destroyed. It was clearly the duty of the Commissioners to preserve the natural scenery of the valley intrusted in their care; but instead of doing this, they have leased out all its level parts to a firm of contractors for a nominal price, and have allowed them to convert it into a hay farm, and to acquire a monopoly of all the forage sold in the valley. No visitor can now enter the valley on horseback or in a carriage without being compelled to pay an exorbitant tax to these contractors in the shape of the price demanded for the feed for his animals, while all visitors are subjected to unauthorized extortions imposed by the Commissioners or by their agents. The noble Black Oaks and Pines which once dotted the park-like valley or lined the banks of the Merced, where it flowed through charming natural meadows, have been cut down or trimmed up in order to increase the area of arable land; and the wild flowers, the natural grasses, the clumps of wild Roses and other native shrubs have all been grubbed up.

The valley is everywhere intersected by barbed-wire fences, closing the paths which lead across its undulated surface and shutting up many of the best points of view of

the surrounding mountains. All freedom of enjoyment is ended, and all sense of naturalness destroyed. The grandeur of the mountains and the beauty of the mountain torrents the Commissioners have not yet been able to destroy, but the value of these even is lessened when seen across fields bounded by barbed-wire fences and torn up by a patent gang-plow. If in all the length and breadth of this land there was one spot which should have been held sacred to the wild beauty of nature—one spot which should not have been marred for sordid ends—it was the Yosemite Valley. It belongs to the Nation, and there is no intelligent American who does not rejoice that such a marvel of nature exists within the limits of his country. The people of the Pacific States are not more interested in its preservation in all the integrity of its beauty than are the inhabitants on this side of the continent, and the cry of warning and of protest raised by the press of California will be echoed from one end of the land to the other.

We begin this week the publication of a series of elementary articles upon Vegetable Physiology with special reference to the plants of the garden and the forest, from the pen of Professor George L. Goodale, Fisher Professor of Natural History in Harvard College, and a distinguished teacher of botany. They are written with the view of bringing the important subject of plant life within reach of all persons of ordinary intelligence and cultivation — business men who take pride in their gardens, professional growers of plants, pupils in high schools, and all the great class of readers who are interested more or less directly in plants, and who want to know something more about them than can be found in ordinary horticultural publications. A most suggestive and interesting fact brought out at the meeting of the American florists, held in this city last summer, was the expression of a belief by some of the most intelligent and progressive members of the Association, that even from a practical point of view some knowledge of botany is necessary to plant growers who aim to get the most out of their business. It is only those men whose practice is based upon a sound knowledge of Vegetable Physiology who are uniformly successful as cultivators. It is for this reason that we have asked our associate to prepare a series of papers which will cover the whole subject, and will make, when finished, an indispensable manual for all cultivators.

The Gardens of the Petit-Trianon.

IT is strange that so few Americans go to the gardens about the Petit-Trianon when they visit Versailles. After having walked all over the main palace and the gardens the day is far spent, and they are weary of sight-seeing. But what a relief it is, after the great masterpiece of Le Nôtre — the formal, clipped trees, the straight alleys and the architectural gardens—to find in the Petit-Trianon a piece of natural-looking country, large, well-formed trees and quiet scenery—a garden laid out in what used to be called, and is still, in France, the "English" style. And it is especially interesting to Americans on account of the large number of our native trees there, some of which are the original specimens sent over by the elder Michaux, and planted there nearly one hundred years ago.

In 1774 Louis XVI. presented the Petit-Trianon to Marie Antoinette, and at once, under her direction, began the formation of the "English Garden." Of the many plans which were offered that of the Comte de Caraman was finally adopted, but was afterwards slightly modified by an architect named Mique, who had the carrying out of the work. The general design is very simple. A brook, starting from the highest point, winds about through the lawn in rather a needless manner, and three principal groups of trees are so placed as to form agreeable vistas. Such is the appearance from the windows of the château, but on going a little further into the grounds there is a very pretty piece of water, with several picturesque buildings on the opposite shore. (See illustration, page 7.) Near by are several fine deciduous Cypresses (*Taxodium distichum*) growing on the very edge of the water, and sending up their curious knees, not only in the water itself, but in the grass, and even in a neighboring walk. And not far away are to be seen two or three magnificent White Pines, one of which must be fully 100 feet high and measuring ten and a half feet in circumference at five feet from the ground. But the most remarkable American trees there, besides those already mentioned, are the Cedars (*Juniperus Virginiana*), some thirty feet high, and developed into picturesque forms, with the lower branches resting on the ground. A long list could be made of the different kinds of American trees there; but a few may be named to show the great variety in the plantations. Among the Pines of our country, besides the White Pines, already mentioned, are: *P. inops*, *P. Tæda*, *P. insignis*, *P. ponderosa*, *P. Lambertiana* and *P. Coulteri*; among the Spruces, *Picea nigra* and *P. alba*; among the Firs, *Abies balsamea* and *A. nobilis*, and to these must be added the Hemlock, both the Sequoias, the Douglas Fir and the Larch (*Larix Americana*). The Oaks are well represented by fine specimens of the Red, Willow, Scarlet, White and Burr Oaks, with Birches, Hornbeams, Beeches, Elms, Liquidambars, Sour Gums, Cottonwoods, Lindens, Maples, Hickories, Magnolias, Tulip Trees and Catalpas.

Many of these trees at the time of the formation of the gardens were extremely rare or quite unknown in France.

On the site of what used to be the botanic garden, where some of the earliest experiments in the naturalization of foreign plants were made in France, is now a pretty flower-garden, which contains a good collection of American plants—Rhododendrons, Azaleas, Andromedas, Kalmias and Magnolias. Two fine Gingko trees, one of which is about forty feet high, stand here, and are, I believe, the oldest in France, having been planted about 1789. A fine cut-leaved Beech, a curious but handsome Weeping Sophora and a splendid Pyramidal Oak make up the more remarkable specimens in this part of the grounds.

Paris. *H. S. Codman.*

Notes from a South Carolina Naturalist.—I.

THE following wayside notes of Pines, and other trees and plants, were made in October upon my return home from a day's ride to the Savannah River:

Our Carolina "low country," with its sandy lands, its forests of Pine and swamps of Cypress, may seem tame and uninteresting to strangers, but to those of us whose home it has always been, it possesses a certain charm, especially during this delightful autumn season.

The river bluff fronts southward, and one looks across the marshes to the various islands which stretch out at last to Dawfuskie and the ocean. The growth along the river is mostly of Live Oak and Hickory, and only a few Palmettoes, once so plentiful here, are to be seen; and it is to be feared that this beautiful Palm, which is still being cut along the whole of our sea-coast to build the wharves of Charleston, will eventually be destroyed, and our historic tree be thus lost to us.

Besides the Live Oak, there are handsome trees of Water Oak (*Q. laurifolia*), perhaps the most beautiful of all of our Oaks; also of *Q. aquatica*, *Q. falcata*, *Q. alba*, *Q. obtusilloba* and *Q. Catesbæi*. *Ilex Cassene* is, of course, everywhere, its berries now reddening under the influence of the fall weather. The autumn show is not as brilliant as in past seasons, owing to the long and terrible drought of the summer and the late downpouring of rain, which have partly destroyed the harvest of Rice and Cotton. Yet the Yellow Gerardia is to be seen in all its glory, even though we fail to find in the damp lands the purple-flowered species (*G. purpurea*), which usually covers whole acres in extent, and gives such a charm to the landscape.

Along the sandy bluff-side I find *Liatris elegans*, with its tall purple spikes, some of them most deeply colored. Seeing these beautiful plants reminded me of a sight which I have never forgotten. Many years ago, passing through an old sandy field along the river at Montpellier Place, I saw an acre or two of them in full bloom. It was late in the fall, the atmos-

phere crisp and bracing, but in spite of the light frost the plants were in all their perfection of height and color, and I wondered at the great number of large and brilliant butterflies hovering over and alighting on the purple spikes. The thickly crowded purple blooms, the hovering insects, the sparkling river fringed with Live Oak and Palmetto, and overhead the autumn sky—all these producing a sense of exhilaration and happiness, the recollection of which at this day even is most pleasant.

Of Golden-rod I see mostly *Solidago tortifolia* and *S. retrorsa*. We now turn from the river, the road carrying us through a damp, flat Pine-land of Saw Palmetto (*S. serrulata*), and the first Pine to strike the attention of the botanist would probably be *P. Cubensis*, the *P. Elliottii* of Engelmann. But the turpentine-chippers and wood-cutters are in the land, and the Pines are either scarred and mutilated for the still, or cut down for timber, and thus it happens that few large and handsome trees are now to be seen. This tree is the earliest of all our Pines to bloom, the deep violet-purple buds showing themselves in December or January, and later discharging their pollen from two to four weeks before the others, according to season and latitude.

The deep violet or rose-purple aments are in color like those of the long-leaved Pine (*P. palustris*), and every year does their exquisite hue surprise and charm us afresh, as does the blue of the Gentian (*G. Elliottii*) in November, or the pale lilac of the Swamp Aster (*A. paludosus*) in October. The leaves of *P. Cubensis* are by twos and threes, and of a deep green color. The female aments are at first erect, but they soon commence to recurve, so that in April or May they are close to the stem. I know not if other Pines, either in our country or elsewhere, ever show this striking peculiarity, but I am sure it is not seen in *P. palustris*, *P. serotina*, *P. glabra*, *P. mitis* or *P. Tæda*. The red-brown bark resembles that of *P. palustris*, but, as was remarked long ago by Elliott (*P. Tæda*, var. *heterophylla*), it exfoliates in "longer scales." At this date of writing I observe that the cones of our other Pines are still green, save perhaps those of *P. serotina*, which are of a very pale yellow, whereas those of *P. Cubensis* are brown or cinnamon-colored, and are now expanding wide on the approach of cold weather. A little later they will discharge their abundant seeds. A few of the cones are already dropping, but this usually occurs later in the fall or winter, as is the case with *P. palustris*, while the cones of all the rest cling till they drop, in after years, from decay. It is also worthy of remark that these two Pines, which drop their cones earlier, are the only two which run turpentine and whose timber is in all respects excellent. This tree (*P. Cubensis*), so far as I know, is found growing only under the influence of salt water. I find it in damp and flat Pine-lands, or in wet "slashes," often associated with *P. serotina*, also in sandy, and largely, too, in clay lands, while I have seen the young saplings overrunning the driest and sandiest old Cotton-fields. It is, I think, the tallest of our Pines, and the largest which I ever saw was 110 feet in height, and grew not far from me in a Pine-land "slash."

Many years ago I remember seeing just back of the sand hills on Hilton Head beach a few of these trees. They were not remarkable for height, yet from their girth and twisted branches one could imagine that they had stood the storms of centuries, and, for aught we know, had been sighted by Jean Ribault upon his making the harbor, or even by Melendez, when the "dark helm" of the Spaniard "hovered" over the waters of Port Royal!

Even as early as the 28th of September I observed that the cones of a few trees were opening, though I saw no mast falling. But this had not escaped the keen eyes of the jackdaws, for a tree top was black with them, and later the woods will ring with their joyous notes when they are picking the Pine mast from the cones. I hear now the rush of the birds and see their almost friendly rivalry as, with expanded wings, they take every attitude upon the cones, up or down, while the seeds are falling and twirling round and round in the autumn sunshine. Looking at such a picture, listening to the noise and clatter and the sweet exhilarating note of the birds, one craves the hand of Audubon to paint it! Nor is color wanting in the brown cones, the glossy blue-black of the birds and the deep green fans of the Pine!

As we go on we glance at the Pond Pine—the Black Pine of the country folk, the *P. serotina* of Michaux. Dr. Engelmann considered this Pine a variety of the Pitch Pine, *P. rigida*, but I am not sure that this has been accepted by all botanists. I am informed that this latter Pine, *P. rigida*, is invariably found further north in dry and sandy lands. Elliott speaks of a tree which he refers to as *P. rigida* and its being found sparsely in the low country of South Carolina. But this tree I have never yet met, nor have I ever seen any one who could tell me anything about it. I have often looked for it. Elliott's home was not over twenty-five miles from this place and he speaks of *P. rigida* as "a large tree from 70 to 100 feet in height and two to three in diameter." He says, also: "This tree is not very common in the low country of Carolina, where it generally grows intermingled with trees of other kinds, not forming forests exclusively of Pine." Evidently he had seen it in the low country and it seems strange that it has disappeared. We next meet with *P. palustris* as we get into more sandy land. Although we have sometimes seen this tree in damp or wet places, the old name of *P. palustris* seems inapplicable, for, certainly, its finest forests are in the sandiest land. We have passed the *Eupatorium scabridum* of Elliott, which, after all, seems to be but a variety of *E. rotundifolium*, but the bloom of both has long since been over. Some fine plants, however, of *E. album*, are in bloom now, and *E. aromaticum* only in bud. The road becomes more deep and sandy, and on the roadside hedges are *Aralia spinosa*, and the "French Mulberry," Callicarpa. The fruit of this last is beautiful, indeed, but it is esteemed too common for cultivation. Some years ago, near sunset, I was collecting its fruit, but a mocking bird was standing guard on the shrub and most vociferously disputed my taking the purple clusters, flying up and around me with extended wings, as he might do when his nest is assailed in the spring. As I left with my booty he seemed clamorously to pursue me, and even when I was well out of his reach, I still heard his scolding. As I pass along the sandy field of cotton I recall that it was here, on each side of the roadside hedge, that I found, I think, three separate plants of an Asclepias, which seemed but a freak of *A. tuberosa*, which last was very abundant in this spot. It has long since utterly disappeared, but good specimens were sent both to Drs. Gray and Engelmann, and, I think, also to Mr. Canby.

I append a few notes of this plant, which, at the time, greatly excited my curiosity: Leaves of the calyx linear, curved *upwards between* the leaves of the corolla, which are linear-lanceolate, and, as usual, reflexed, but of a deep blood-red color. Leaves of the stamineal crown of the same deep crimson, *spreading* and *reflexed*, deeply cleft and *bearing no horn*. The gynostegium, therefore (which is greenish yellow), *naked*. Flowers much smaller, and umbels, also, than in *A. tuberosa*, but extremely brilliant and ornamental. This plant, like *A. tuberosa*, exudes no milk; it is hirsute, and in all other respects, both as to stem and leaf, like *A. tuberosa*. Whether hybrid or monstrosity, I never learned accurately.

Bluffton, S. C. *J. H. Mellechamp.*

Foreign Correspondence.

London Letter.

BOOKS.—Several works by eminent botanists and gardeners have been added this year to the literature of the garden. The one likely to prove the most generally useful to the horticulturist is Nicholson's "Dictionary of Gardening," a careful and comprehensive encyclopædia of plants and garden matters generally. It has taken four years to complete it, and already it is quoted by many as the standard authority on garden nomenclature, the editor's well-known carefulness and extensive knowledge being a guarantee of its reliableness in this respect. Certainly this work fills a gap which horticulturists generally often had occasion to deplore. Mr. Baker, of Kew, whose sympathy with horticulturists and interest in their work is quite exceptional among botanists, has added another useful work to the many already prepared by him. I refer to his book on the order *Amaryllidaceæ*. It contains descriptions, in good plain English, of all the species and most marked varieties of the genera included in this order, and it is the result of twenty-three years' notes and observations. Here this book is of great value for reference. It ought to be in every gardener's library. Mr. Bolus, an eminent Cape botanist, and certainly the first authority on Cape Orchids, has just published a very valuable book on the Orchids of the Cape Peninsula. Mr. Bolus has studied most of these plants in a living state, and, as he discourses on the conditions under which they grow naturally, much useful information for the cultivator is contained in his book. For with only one or two exceptions the management of Cape Orchids here has not yet been mastered. Veitch's splendid Orchid Manual already comprises Odontoglossum, Cattleya, Lælia, Dendrobium and several small genera, and I learn that the number on Cypripedium will shortly appear.

GRAMMATOPHYLLUM SPECIOSUM (see GARDEN AND FOREST,

p. 468).—This wonderful Orchid cannot be cultivated with any success in England. It has flowered only once here, I believe, namely, in the collection of the late Mr. John Day, of Tottenham, and that was on a newly imported plant. Mr. Day, who had seen the plant in its native haunts, said it grew on stout branches of trees overhanging rivers, and the plants were always within a foot or so of the surface, so that its roots were in the water. It also requires great heat and bright sunshine. Plants are in cultivation at Kew, but they do not thrive. An Orchid with pseudo-bulbs as thick as a man's wrist, and eight feet or more long, the flower-scape six feet high and one inch in diameter, bearing numerous flowers nearly six inches across, and colored rich yellow with purple spots, is something worth striving for; but these flowers seem unattainable in England.

CATASETUM BUNGEROTHII.—This plant is certain to bring many of the species of this extraordinary genus into popular favor, as it has proved surprisingly beautiful and easy to cultivate. When it was first talked of most Orchid-growers doubted there being a Catasetum with such attractive characters as were ascribed to *C. Bungerothii*, but it is immensely popular here now. Mr. Sander has a great number of plants in bloom, showing considerable variety in form and coloring. At Kew this and several other species are in flower. One of these, *C. lanuginosum*, had two supposed distinct varieties of flowers springing from the same pseudo-bulb. Had there been only one of the spikes, this plant would certainly have been called a new species, but the second spike proved that this was only one of the extraordinary freaks to which Catasetums are addicted. Dr. Lindley described one of them which bore flowers of three supposed genera on the same spike.

SOPHRONITIS.—A quantity of plants in good condition, of the rose-colored variety of *S. grandiflora*, have lately been imported. It is almost as large-flowered as the best form of the type; the pseudo-bulbs and foliage are brownish, the latter very thick and fleshy; but the only marked difference is that of color, the type having flowers of a brilliant scarlet, whilst in the variety rosea they are bright rose-purple, almost clear red. This form first appeared in a London collection in 1884, when it was figured in *The Garden*. A good example is now flowering at Kew. *S. cernua* is also in bloom here. It is small-flowered, each peduncle bearing several flowers of a cinnabar-red color. Except to complete a collection, this species is not worth cultivating. *S. violacea* is a better plant. It blooms in winter and spring, and lasts a long while; and the flowers are an inch across and violet-purple in color. In the form of its pseudo-bulbs and leaves, too, this species is peculiar and interesting. Of course, all the kinds thrive best when grown in the coolest and moistest Orchid-house.

CALANTHES form the brightest and most graceful picture in our Orchid houses just now. They are everybody's plants. Here they are grown for the conservatory, the two oldest and best, *C. vestita* and *C. Veitchii*, being as easy to grow and as beautiful when in flower as the most popular of decorative plants. But there exist kinds in a few English collections which, when sufficiently multiplied, will be a great acquisition as winter-flowering plants. Such are *C. Burfordiensis*, with crimson and vermilion flowers; *C. Veitchii splendens*, almost as dark in color; *C. Sandhurstiana*, and one or two others. These are seedlings or crosses from *C. vistita* and *C. Veitchii*, which have been raised in the gardens of Sir T. Laurence. *C. veratrifolia*, *C. biloba* and *C. Natalensis* are also flowering here.

There are four particularly bright plants in the green-house just now. The first is *Reinwardtia tetragyna*, a relative of the old *Linum trigynum*, but a much superior plant. Its flowers are borne in large clusters on the ends of the short branches, well grown plants being simply irregular masses of the softest yellow bloom. This plant is not understood well in nurseries, and I have heard it spoken of disparagingly by growers whose plants were a proof of their ignorance of its requirements. These are simple enough. A warm green-house, shade from bright sunshine, plenty of water always and a fair amount of root room, are the conditions which have produced the plants admired now by every one at Kew. *Mesembryanthemum blandum* is practically unknown in horticulture, but it is a handsome and useful winter-flowering plant, nevertheless. It is compact, the branches erect, with bright green, almost terete leaves, two inches long, and flowers, as big as half-crowns, white, full and lasting. Most of the plants of this genus close their flowers, except when the sun shines upon them, but this species is an exception, as its flowers are expanded in all lights. *Sericographis Ghiesbreghtii* makes a delightful little picture in our green-house just now. It is treated in the same way as the Reinwardtia. It grows here to a height of twelve and a half feet, is freely branched, and clothed with axillary and terminal panicles of graceful, tubular, scarlet flowers. A group of well-grown plants when in flower cannot be easily beaten. *Lucullia gratissima* completes the quartette, a plant which most people delight to see, but few cultivate with success. Planted in a bed of rich peat in a sunny position in the warm green-house it forms a shrub ten feet high, and every branch is now bearing a huge head of handsome rosy-white flowers, which emit a delicious fragrance, and remain in beauty a month or more.

PRIMULA JAPONICA.—By a little management this fine Primrose may be induced to flower almost at any time. At Kew it is now in beautiful condition in a cool green-house, where it will continue to flower all winter. In the summer it is happy in a sunny border out-of-doors. Plants raised late and kept in pots commence to flower in autumn, and so on. There are many varieties of it, one of the most distinct being pure white, save the blotch of dull yellow on the mouth of the tube. Rose-colored, deep crimson and flaked varieties are also common. This species is hardy enough to take care of itself out-of-doors all winter in England. There are not at present any yellow-flowered varieties known, but in *P. imperialis*, now called *P. prolifera*, we have a species very similar to *P. Japonica* in foliage and inflorescence, differing only in having pure sulphur-yellow flowers. They are not quite as large as those of the Japanese plant, the width of the limb being only half an inch. Some examples now in flower at Kew have peduncles two feet high, bearing four whorls, each three inches apart, and each whorl containing a dozen flowers. Good cultivation, with selection, ought to evolve a first-rate flowering plant out of this Primrose. The form in cultivation is that found in the Himalayas. There is, however, another variety of it in Java, with foliage like dock leaves, and a flower spike five feet high; but so far as is known, this noble Primrose has not yet been introduced.

Several species of Kniphofia are flowering out-of-doors here, an unusual occurrence in December. *K. hybrida sarmentosa* is quite gorgeous, even now. It has spikes a yard high, and heads of flowers eight inches long; the color of the upper flowers is bright orange-scarlet, the lower flowers being sulphur yellow. *K. Saundersoni* is also flowering freely. The Kniphofias are receiving careful attention from several horticulturists in England, who aim at improving them both in respect to hardiness and flower-color, by means of hybridization and selection. A great number of species and varieties are cultivated at Kew. *W. Watson.*

December 6th, 1888.

New or Little Known Plants.

Neillia Torreyi.*

IT is somewhat remarkable that the dwarf Ninebark of the Rocky Mountains, the *Neillia Torreyi*, has not become common and a favorite on lawns and in shrubberies. The larger species, *N. opulifolia*, more popularly known as *Spiræa opulifolia*, with its golden-leaved variety, is in frequent use for hedges and for ornament. The great objection to it is its rampant growth and need of free and frequent cutting in. The *N. Torreyi*, on the contrary, while resembling it very closely in many respects, is rather compact in its habit and is only two or three feet in height. It is a free bloomer and would be perfectly hardy in the coldest winters. The form of the leaves is the same as in the other, but they are smaller and usually more pubescent, sometimes white-tomentose on the lower side. The flowers are in smaller clusters and scarcely more than half as large, and the fruit, which is composed of only one or two tomentose seed vessels, never becomes so inflated and conspicuous, as is the case in the common Ninebark. It would certainly be an ornament to any lawn, and where only a low hedge is needed, it would probably prove very satisfactory. The shrub is not rare in the mountains of Colorado and westward through the Wahsatch, and in some of the ranges of Nevada. *S. W.*

[Mr. Faxon's drawing is made from a plant which has flowered during several years in the Arnold Arboretum. It is perfectly hardy, and ripens seeds abundantly.—ED.]

*NEILLIA TORREYI, Watson, Proc. Amer. Acad., ii. 136.—Our two species that are referred to *Neillia* have been separated from that Asiatic genus by Dr. Maximowicz, of St. Petersburg, and constitute his genus *Physocarpus*.

Cultural Department.

Forcing Fruits and Vegetables Under Glass.

THE gardens of the country home of Mr. Pierre Lorillard, at Jobstown, New Jersey, have long been famous for the fruits and vegetables forced in the green-houses there. These gardens contain an unbroken range of glass over 900 feet in length, which is divided into many compartments to suit the different crops grown in them. The houses of this range face south, but there are others besides running north and south from the main range. A year ago Mr. John G. Gardner, formerly the gardener to Mr. Lorillard, leased these premises for six years, and is now operating them as a market garden.

PEACHES.—In the compartments devoted to peach-growing the trees are planted inside the house, and their tops are spread out on trellises. While these trees are inactive in winter, the temperature is kept constantly low, but as Peas and Mushrooms are grown in them at this season, frost is excluded. In some compartments Peach-trees grown in pots and tubs are forced, and these trees are now (December 10th) out-of-doors with their pots and tubs buried in the ground. This treatment serves to ripen the wood and prepare it for early forcing, and it also preserves the roots from any injury by frost. While frost may not injuriously affect the roots of Peach-trees growing permanently in the open ground, freezing the roots of pot or tub-bound plants, whether of Peach, Plum or any other tree or plant, no matter how hardy, does them no good, and possibly much harm. The green-houses now emptied of these Peach-trees are used as forcing-houses for Tomatoes. All Peach-trees grown under glass, no matter whether planted out or grown in tubs, are on Plum roots. The Plum stock checks the gross luxuriance of the Peach, promotes the production of short-jointed, firm, fruit-bearing wood, adds vastly to the longevity of the tree, and, in Mr. Gardner's opinion, gives much more highly flavored fruit. Early Alexander, Early Louise and Early Rivers are his favored varieties. When the Peach and Nectarine trees are in bloom, in order to assist in the fertilization of the flowers and set a heavy crop of fruit, Mr. Gardner brings a colony of bees into the green-houses, and they do the work effectually. I know from personal experience that honey-bees are among the most useful agents we can employ in fertilizing early-blooming plants, whether trees or herbs. And I have often insisted that if our Pansy and other seed-growers would keep bees in their seed-grounds they could harvest much more seed than they do, and that if the bees seem to ignore the special flowers in favor of more distant fields, they may be shut in green-houses with the flowers.

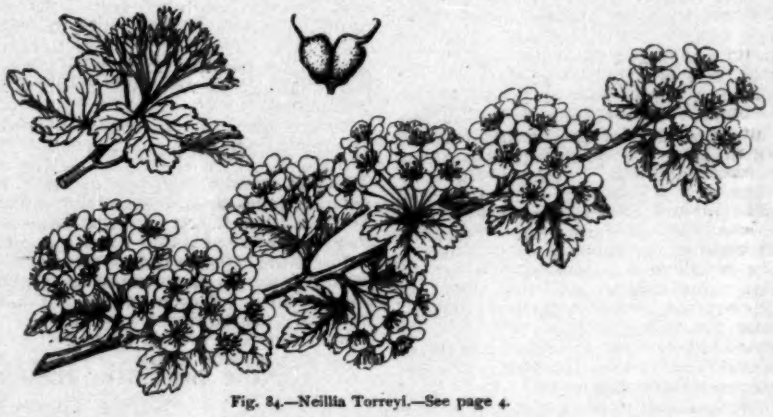

Fig. 84.—Neillia Torreyi.—See page 4.

NECTARINES.—These are largely grown, both as planted-out and pot plants, and Mr. Gardner favors them, as they are in good demand, and the market is not nearly as well supplied with them as it is with peaches. Lord Napier is his favorite variety. They are on Plum stocks. The routine of their cultivation is much the same as that of the Peach-trees.

STRAWBERRIES.—These are forced in large quantities. They are all in pots and still outside. Although he grows Elton Pine (a foreign variety) a good deal, he is partial to the Sharpless, as it has the constitution, the foliage and the pollen, and not only sets well itself, but when grown along with other varieties, has a capital fertilizing effect upon them, and there is no better variety to associate with pistillate kinds.

GRAPES.—All the permanent vines—and they occupy many houses—are planted in-doors, but quite a number are also grown in pots. Those grown in pots are for early forcing mostly, and are now thoroughly ripened, pruned and buried under ground out-of-doors, like ordinary Catawbas or Raspberries, the pots having first been plunged in a row in the ground. Here they remain at rest till a house is empty and convenience permits of their being brought in-doors for forcing. The vines occupying permanent green-house quarters were unfastened from their trellises, and pruned or partly pruned, the end of October, and then laid together in a row just over where they are planted (inside the house), and here boxed up securely from light or the warmth of the green-house, and, at intervals of several yards, are ventilating, chimney-like shafts running from the boxes up through the glass roof. These vineries are now used during the winter months for forcing Tomatoes and Snap Beans.

TOMATOES.—These are forced in very large quantity; indeed all of the vineries are used as Tomato forcing houses in winter. Some of the Tomato plants are grown in large pots, but the great mass of them are grown in boxes set upon the stages and within about five to seven feet of the glass. The variety grown is the Lorillard, which is a selection of Mr. Gardner's. It is a smooth, even, medium sized variety with a bright red skin, and the ripe fruits are firm and solid and capital for shipping. The plants are raised from seed sown in flats, and in order to maintain a regular succession of young stock a fresh sowing is made every ten days. As soon as the seedlings are big enough, they are potted singly into small pots, and they are repotted into larger sizes till the six-inch pot is reached, from which they are planted out in the boxes. They are never planted out till after they have shown one or two clusters of flower-buds, and this for a reason seldom observed by cultivators—that the flower clusters on Tomato vines all grow on one side of the vine and not here and there around the vine, and it is to note the side on which the blossoms appear that the plants are kept in the pots so long; for in planting in the boxes the gardener is always careful to have the flower-bearing side of the vine face the south.

The boxes are of rough hemlock boards, and are a foot deep, and about two feet long by some twenty-two inches wide, and as they are set upon the green-house stages the boxes themselves are bottomless. The earth used is common garden soil and well rotted manure, and after the plants have attained considerable size a mulching of rotted manure is also added. Four plants are set in each box—a plan in each corner. As Tomato plants seldom show any flowers from the first half dozen joints of the vines, in order to shorten the stems and let the fruit begin from the ground, the naked part is laid down and the plants at the opposite corners of the box cross each other—for instance, the plant set out in the north-east corner of the box is layered on the ground and brought up in the south-east corner, and the one that had been planted in the south-east corner is brought up in the north-east corner. The plants grown singly in large pots are coiled around on the surface till the first flower joint is reached.

The vines are all kept to a single stem—that is, no branches or laterals are allowed to grow—and each vine is trained up to a string fastened at the corner of the box, and, running perpendicularly, to the roof of the house. The boxes are not placed close against each other on the benches, but at intervals of nearly two feet apart. This allows the plants to be about two feet distant from each other, and admits sunshine and a free circulation of air. The plants are allowed to climb on the cord as high as they will, so long as they retain short-jointed, lusty vigor. The more vine, the more fruit, as every third, or sometimes every fourth, joint, has a fruit cluster.

A night temperature of 57° is maintained. Tomato plants in winter are slow to set fruit without artificial assistance, but Mr. Gardner finds no difficulty in securing sets on every cluster. First he provides a sweet, dry atmosphere in the house; then in the forenoon he takes a padded stick, and goes through the plants, giving each one a sharp but gentle tap to scatter the pollen. The first fruits are ripe for market in about ninety days from the time the seed is sown.

ASPARAGUS.—Mr. Gardner forces a good deal of Asparagus, but does not begin with it so early as November. He uses four-year-old plants. These plants are grown expressly for forcing, and on the surface plan—that is, they are not planted deep in the ground as if for permanent beds. As good Asparagus comes in from Florida long before the winter leaves us, whatever money is to be made with this vegetable must be made before February is over. Asparagus-roots that have been forced are of no further use; strong, healthy, young stock is too easily raised to make it worth while to keep over enervated roots or to try to recuperate them.

CUCUMBERS.—These are grown in the small span-roofed structures, a row being planted on either side and trained up on trellises under the glass. A temperature of about 60° is maintained, and there is full provision for bottom heat. The Telegraph and Blue Gown are grown as the main crop, but the White Spine is largely forced also. The first two are English, long-fruited varieties, extremely prolific and long-lived, and there is a good sale for them in the Boston and Philadelphia markets, but very little demand for them in New York. Taking everything into consideration, the Telegraph is yet looked upon as the most desirable and profitable of the English varieties, while in the New York market there is a marked preference for what are known as American, or short, thick Cucumbers, although the whitish color of the skin that often appears near the end of the fruit in these sometimes gives them the appearance of having been kept too long. An effort is being made to get a short Cucumber that shall have a deep green skin, without any pale tinge or marking near the end.

PEAS.—Large quantities of these are grown and all in boxes. American Wonder is the variety used. It is very dwarf, a fair cropper, and has good sized Peas of excellent flavor. The boxes in which they are grown are long, narrow and trough-like, four to five inches wide and six inches deep, and of lengths to suit the spaces in which they are grown, say four to six feet long. The earth used is common garden soil enriched with rotted manure. A single row of Peas is sown along the middle of each box. After sowing and until the Peas are well up, they are kept as cool as possible, without subjecting them to frost, but after a good growth is made, a little higher temperature is maintained. In the green-houses the boxes are set about six inches apart from each other, and laid across the benches—that is, the Pea boxes are placed north and south in houses running east and west. This is to admit of a free circulation of air under, between and over them.

SNAP BEANS.—These are forced in abundance and are grown mainly in boxes, but, in some cases, also in temporary troughs on the benches. The boxes are six inches wide, six deep, and twenty or twenty-four inches long, and the soil used is the same as that used for Peas. Sion House, an English variety, is the only one grown, and this selection has been made after testing all other leading varieties. The Beans are sown in three-inch pots, and when the plants are four or five inches high, they are transplanted into the boxes, eight or ten plants in each box. The boxes are then placed on the benches in the warm green-houses, usually in the Tomato houses, crosswise, and each box distant from the other about six inches

Glen Cove, N. Y. *Wm. Falconer.*

The Francoas.

The Garden, of London, calls attention to the value of the Francoas as ornamental flowering garden-plants. They are all natives of Chili, and are perennial herbs, with white, pink or red Saxifrage-like flowers, produced in slender, graceful racemes. *Francoa ramosa*, which is very delightfully figured in *The Garden*, has been in cultivation for more than half a century, but none of the species are very often seen in American gardens, where this genus is practically unknown. It was named in honor of a Valentian, Dr. F. Franco, who promoted botany in the sixteenth century, and it belongs to the Saxifrage family. The following directions for the cultivation of these plants are quoted from *The Garden*:

"As in the case of many Chilian plants, Francoas are impatient of wet, needing, if they are grown in the open, a dry, sheltered position and a light loamy soil. We can occasionally see them in old cottage windows, where they often flourish amazingly. The best way is to raise the plants from seed, which can be sown at any time between the month of February and midsummer, but it is better to commence as early as possible, so that the plants will have a long season of growth before the winter. Sow the seed in a well-drained pan, and use a peaty soil mixed with sufficient sand to make it fairly light, and before sowing give it a careful watering and place a sheet of glass over the pan, so as to promote quick germination. When the seedlings appear, remove the glass at once, and give water if necessary, placing the pan in a light position so as to keep the seedlings strong and healthy. After a time the seedlings may be pricked off into other pans filled with the same soil as recommended above, and be taken to the green-house or a cold-frame. It is essential to give air freely to prevent the plants becoming drawn. When of sufficient strength transfer them to five-inch pots, still keeping them in the green-house or frame. By the end of the summer some of the plants will commence to bloom if the seed was sown early, but if first-class specimens are wanted, it is better to pinch out the first spikes, so as to obtain an abundant supply the second year, when the plants will be much stronger. When the plants require repotting, give them pots one inch or two inches larger, and in the second year when the flower spikes are commencing to appear a few applications of weak liquid manure will be helpful. The seed may also be sown when it is ripe, which it will be at this season, and the young plants potted off in the spring. We have given a somewhat detailed description of the culture, because it is not every one who has grown the Francoa, and many consider it difficult to bring to perfection. There are many poor specimens in gardens, which often have the bottom leaves absent, but this is due in a great many instances to an over-supply of water. If there is one thing that the Francoa detests, it is a soil that is kept too moist. *Francoa ramosa* is the best of the three, and has spikes of great length, and the flowers are pure white. The leaves are something like those of a turnip, and of a paler shade of green. *F. appendiculata* has the petals of a soft reddish color, enriched near the base by a deep blotch. This is well worth growing, but the blooms are not so pure as those of *F. ramosa*. *F. appendiculata* is sometimes confused with *F. sonchifolia*, but this is different, its flowers being of a purple shade. Although to obtain the finest specimens it is necessary to grow the plants in pots, the Francoas may sometimes be seen in splendid condition on the rockery."

Plants for a Trying Climate.

EIGHT or nine years ago Professor Sargent kindly sent us seeds of *Berberis Amurensis* and of *Lonicera splendens*. The seedlings of the Amur Barberry were planted in a row from the seed-bed, and have made a compact hedge without pruning, which a prairie steer could not penetrate. They have proved far more rapid in growth than any of the Barberries in our large collection, and their foliage has not been troubled with the cluster-cup fungus. When loaded with the oblong, scarlet fruit this section of hedge is much admired. As it proves perfectly hardy in the far North-west, and grows well where the rainfall is very light, I believe it will prove very valuable for hedging and also for planting as a large shrub upon the lawn.

The seedlings of *Lonicera splendens* were also set about two feet apart in a hedge-row. The uniform expression of the row indicates that *L. splendens* is a good species, or, at least, a strain quite distinct from *L. Tatarica*. The flowers vary in size, and from white to dark pink, and the berries vary from red to yellow, but as propagated from cuttings they all have the graceful, rounded habit of growth, and delicate, light green foliage of the typical *L. splendens*. Without exception these seedlings are an improvement for lawn planting or for screens on the Tartarian Honeysuckle or its seedlings.

At the West, what is known as the Wisconsin Weeping Willow, is our only hardy form of the old list common to the nurseries. This led us to introduce *Salix Napoleonis*, of which we saw hundreds of fine specimens on the steppes of east Europe, top-worked on *Salix aurea*, one of the yellowest of the Yellow Willows, that seems to be indigenous to east Europe and central Asia. *S. Napoleonis* has long, thin twigs that move with the breeze, showing to good advantage its blue-tinged foliage, forming a fine contrast with the bright golden-barked stock, on which it is worked. The stock from *S. aurea* is a rapid, upright grower from cuttings, and *S. Napoleonis* works readily upon it by either budding or grafting. It will prove specially valuable in the West, and, I think, generally in the Northern States.

Eleagnus hortensis is not hardy with us, but it is less a matter of regret, as we consider *E. angustifolia* a handsomer tree—larger in growth, and with more fragrant flowers. When favored by the breeze, the fragrance of its flowers has been noticed at a distance of forty rods. It is perfectly hardy up to the forty-fourth parallel in Minnesota and Dakota on dry soils, and it thrives where the rainfall is too light for most of our indigenous trees. It was introduced into

western Nebraska by the Russian Mennonites, where it has become common as an ornamental tree and for hedges and wind-breaks. If some attention is given to pruning up and shaping when young it soon makes one of our best silvery foliaged trees for large or small lawns. The seeds should be mixed with sand and kept where they will freeze during winter.

Even where *Tamarix Africana* and *T. Gallica* are hardy and flower freely, I think the Tamarix of the Amur, with some cutting back to secure compact growth, is more desirable as a lawn shrub. Its foliage is somewhat darker, its expression more graceful, and it flowers more profusely and for a much longer period. But at the west and north it is the only hardy species of the family, and the number of really beautiful shrubs is restricted, hence it should receive the attention of propagators. We find that it propagates readily from cuttings set in the open ground in autumn, and the young wood roots readily in the cutting bench. *J. L. Budd.*

Agricultural College, Ames, Iowa.

The Royal Pavilion.—Park of the Petit-Trianon.—See page 2.

Boudoir of Marie Antoinette.—Park of the Petit-Trianon.—See page 2.

The Dairy.—Park of the Petit-Trianon.—See page 2.

Diseases of the Grape.

SEVERAL inquiries have come to me from readers of GARDEN AND FOREST since the fact was published that experiments here, under direction of the Department of Agriculture, have demonstrated that spraying the Grape vine with copper sulphate solutions will prevent black rot and prevent or cure Grape-leaf mildew.

The best preparation is that known as the Bordeaux Mixture. This is made by dissolving six pounds of powdered copper sulphate (blue vitriol) in several gallons of hot water. Four pounds of new lime are then slaked in sufficient quantity of water. When the two solutions cool they are mixed and diluted with water to make twenty-two gallons.

The vines should be sprayed with this solution before vegetation starts in spring, and every three or four weeks thereafter until the grapes begin to color. The need for more or less frequently repeated spraying will probably depend on the weather. If hot and wet, frequent spraying will be needed. The Eureka Sprayer, made by Adam Weaber, Vineland, New Jersey, is an improvement on the French spraying machines, and is now recommended and used by the Department of Agriculture.

Experimenters with the Bordeaux Mixture will find that their success in preventing Grape rot will be in proportion to the earliness and thoroughness with which the mixture is applied. It may be beneficial to spray the vines in winter or in very early spring. It will also be well to practice as complete disinfection as possible. Clean the vineyard; strip and scrape the old bark from the vines after pruning; remove last year's deposits of leaves, petioles and rotted fruit. Bury everything afterward with the plow, and do not disturb this refuse during the summer by deep tillage. A light smoothing harrow will give all the summer cultivation needed.

When the foliage is dense, care should be taken that the clusters are reached by the spray. The liquid must reach the surface of the berry to exclude the rot-germ. Of course it is not advisable to spray the grapes near the time of the vintage. If the fruit is kept safe until it begins to ripen it is as much as can be hoped for. But the fruit may be infected by the fungus even after it is gathered. I now have white grapes spread out in my wine-house which were kept sound in bags until late in October. They are now specked with black rot.

Sulphate of copper thus used on the fruit is not dangerous to the health of those who partake of the grapes. In the wine made from grapes thus treated no trace of the chemical can be found.

Vineland, N. J., November 29th, 1888. *A. W. Pearson.*

European Chrysanthemums.—I observe that these flowers, and especially the French varieties, are spoken of disparagingly by many American writers, and it cannot be denied that many new plants of very little merit have been sold to confiding buyers. The years 1886 and 1887 gave us a few choice varieties, but very few compared with the number

sent out by the French raisers. This year, however, really good varieties seem the rule rather than the exception, and the majority prove very valuable, in that they are early bloomers, an important item with those who grow their Chrysanthemums in the open air. Among the most distinct and meritorious of the year are Benoit Rozain, rosy pink, of good size and texture and perfectly formed; Condor, pure white, with broad, pendulous flat petals; Cythère, rosy violet, of immense size; Gustave Nadaud, with long, creamy petals, as round as seine cord, and a flower nearly globular; Harman Payne, bright rose; Magicienne, a large spathed orange-brown; Pierre Destombes, probably the finest of the set, with very long, needle-shaped florets of silvery dove color, the flower measuring six inches in diameter; Sabine and Nelson, two unusually large anemone flowered kinds, the first sulphur yellow, the other ashes of roses. All these varieties are distinct in color, of wonderful form, and are equal to any varieties shown in this country, and yet we frankly confess that those of the Philadelphia prize set sent out by Craig last year are the very finest twelve varieties ever introduced at one time.

Richmond, Indiana. *E. G. Hill.*

Principles of Physiological Botany as applied to Horticulture and Forestry.

I.—INTRODUCTORY: REDUCTION OF A PLANT TO ITS LOWEST TERMS, CELLS.—THE LIVING MATTER IN A PLANT.—DIVISION OF LABOR.

PHYSIOLOGICAL botany endeavors to investigate every reasonable question regarding the structure and the life of plants. It depends for the appliances which it uses in research chiefly upon Physics and Chemistry, and therefore its progress has been largely governed by the progress made in those departments of investigation. Hence it has been only within a very few years that improvements in the construction of certain instruments, notably the compound microscope, have rendered it possible for the physiologist to examine satisfactorily some of the more obscure processes of growth and of nutrition. Improved methods of research in chemistry, especially what is known as microchemistry, have lately enabled physiologists to attack some questions which were formerly considered to be beyond the reach of investigation; consequently, many difficulties have been cleared up in recent years. Although far too many questions have not even yet been answered satisfactorily, the additions to our knowledge of the phenomena presented by plants have been important and are worthy of careful consideration.

It seems proper that these recent discoveries in regard to the structure and life of plants should find some place in a journal devoted to the advancement of two important interests which are based largely on physiological botany, namely, forestry and horticulture. But, at the same time, it is clear that accounts of these discoveries can be given in a journal of this character only under certain difficulties, inasmuch as they must be presented in connection with a general view of the subject, and in language as free as possible from technicalities. Moreover, many of the broad, general statements cannot, from the nature of the case, be very strictly qualified, since reference to the numerous minor exceptions must be omitted. The latter are to be looked for in comprehensive treatises.*

The present series of familiar papers will deal with flowering plants—that is, with plants which produce true flowers and seeds, and the examples will be drawn as much as possible from those which possess special interest from the point of view of forestry and horticulture. These plants will be examined with reference to the manner in which they procure their food and perform their work. It is, therefore, necessary to obtain, at the outset, a general idea of the structure of plants; this can be most conveniently done by examining the plant as if it were, what indeed it is, *a machine.*

THE PLANT AS A MACHINE.—When we have any piece of machinery to investigate, our first aim is to ascertain what its essential parts are—that is, by reducing it to its lowest terms, we try to find out what parts could be dispensed with, if we wanted to make a simpler machine to do the same kind of work. Now, in all cases, we find that we can reduce plants to what must appear, at first, very simple terms, namely, *cells.* These cells are bodies of exceedingly minute size, extremely diverse in form and general character, but all possessing certain features in common. These microscopic bodies, or cells, are variously united together to make up the structure of the different organs of the plant; hence we must examine the features which these constituents of the plant have in common before we can examine to advantage the plant itself.

If we make a thin slice through any active, living part of a plant, as, for instance, the tip of the root or the very tip of the stem, we see, under the compound microscope, that it is composed of what look like irregular cavities in a confused mass, and this is the view which the earliest observers held in regard to them. But we now know that these cavities are the interiors of minute bodies which are more or less firmly connected together, and which, from their union, give the whole mass a honeycombed appearance. Each of these bodies or cells coheres, by means of its wall, with the cells next to it. In the youngest parts the walls are thin and delicate, but as the part grows older the walls undergo great changes in thickness, hardness, color and so on, but great as these changes are, they are not so marked as that which goes on at the same time in the interior of the cell.

Each young living cell is filled more or less completely with living matter, technically termed *protoplasm.* This living matter in the cells is the only living thing in the whole plant; upon its health, activity and life depend the health, activity and the life of the plant. As long as the living matter in a cell is in a state of health and activity, the different kinds of work can go on. But it often happens, for instance in the cells of a seed which is fully ripe, that the living matter may become for a time inactive, but still ready to resume its activity under favorable conditions. Or, as is more frequently the case in our woody plants, the living matter may, as it builds up new cells, leave the seat of its former activities, and abandon the thick-walled cavity for a new home in the living and younger parts. When the living matter thus removes bodily, so to speak, from the older cavities, the shells, or cases, or old cell-walls, which once held it, become dead.

This is precisely what happens in the formation of woody parts; the cavities no longer contain living matter; their walls are simply the empty cases or shells of what once were the walls of living cells, now dead. Hence, when we speak of a piece of heart-wood exhibiting, under the microscope, the shapes of the cells, we mean merely that we have here the now hardened walls of what were once active, living cells.

It is difficult to realize that the only living parts in the stout trunk of a tree are the cells which are just under the bark, and the cells which are situated here and there in the bark itself. The wood, which plays such an important part as a mechanical support, is lifeless; it is the record of what once had life; it was built up by the living matter which now has passed on to further work of construction.

Nor is it less difficult to realize the significance of a fact which has been discovered within the last few years, namely, that an intimate union exists between the living contents of neighboring cells. It has been shown that the living matter in one active cell is connected with living matter in contiguous cells by exceedingly delicate threads of the same substance.

It is only by the use of recent improvements in appliances for investigation that these threads of living matter can be shown to exist, and hence formerly it was taught that there was no continuity between the living matter in one cell and that in those next to it. The discovery that such a vital connection does exist has led to a generalization which is probably sound, that all the living matter throughout a plant is in reality continuous.

There are many plants of minute size in which the living matter can be studied easily. These microscopic plants inhabit fresh water and possess the power of taking from it all they need for nutrition and growth. They simply consist of single cells, and yet they are able to perform practically all the kinds of work done by plants of such complicated structure as our forest trees and garden shrubs.

But in these exceedingly simple plants, where the different kinds of work are performed by a single cell, there is no clear division of labor; at least we cannot see by what part of the cell the absorption of food-materials takes place, or by what parts respiration is carried on. When, however, we examine any one of the common plants about which this series is to treat, there is more or less distinct separation of the kinds of work, and the division of labor requires different organs. These organs, such as roots, stems and leaves, all co-operate as completely as did the indistinguishable parts in the plants composed of a single cell; all the living cells in all the organs co-operate; each assists the others and is

*The following works will be found useful for reference:
Gray's Botanical Text-book, *Sixth Edition.*
Vol. I.—Structural Botany.
Vol. II.—Physiological Botany.
Vine's Physiology of Plants.
Sachs' Lectures on The Physiology of Plants.

in turn assisted by all the rest. There is a true community of interests throughout characterized by such complete co-ordination that we are accustomed to speak of a shrub or a tree as if it were in fact an individual, whereas it is composed of myriads of independent and yet dependent parts. These parts are the cells, apparently simple to the last degree in their structure, and yet infinitely complex in their organization. As a drop of water under the rays of light which strike it has been said to mirror the universe around it, so these simple spheres may reveal to us something of the mystery of life.

Cambridge, Mass. *George Lincoln Goodale.*

The Forest.

Forest Tree Planting in Massachusetts.

THE first issue of this journal (vol. i., page 11) contained the report of a committee appointed to award the prize offered by the Trustees of the Massachusetts Society for Promoting Agriculture for the best plantation in Massachusetts of not less than five acres of European Larch. The following report upon another competition under conditions explained in the text has lately been made to the Society. The committee of award were C. S. Sargent, John Lowell and F. H. Appleton; and it may be added that the recommendations of the committee have been adopted and the premiums paid.

The Trustees of the Massachusetts Society for Promoting Agriculture offered in 1876 six competitive prizes for plantations of trees, to be made in Massachusetts during the following year. The conditions of this competition required that the plantations should cover not less than five acres. Two plantations only were made, and the trustees being desirous of increasing the knowledge of tree planting, especially among working farmers, offered the next year (1878) a series of prizes to be awarded during the present year for another competition, into which were admitted smaller and less expensive plantations, and plantations to be made by sowing the seeds where the trees were to stand. The following prizes, amounting to fourteen hundred dollars ($1,400), were offered in this second competition:

Two prizes for 5,000 White Ash trees.
Two prizes for 1,000 White Ash trees.
Two prizes for five acres of White Pine, raised from seed.
Two prizes for one acre of White Pine, raised from seed.
Two prizes for one acre of Scotch Pine, raised from seed.
Two prizes for one acre of European Larch, containing not less than 2,000 trees.

Thirty-four entries were made in competition for these prizes, by twelve competitors, and your committee find that eight of the twelve competitors have for various reasons withdrawn entirely; some failed to make their trees grow at all, and others neglected to take care of them after they had become partially established. The sowing of seed produced small results. In two cases it did not germinate at all, and in another the percentage of plants raised was small. It must be remembered, however, that there was an early and prolonged drought during the summer of 1878, and that the season was unusually unfavorable for tree planting, and for the germination of tree seeds.

Your committee has visited the plantations of the four competitors who had not formally relinquished their claims to the prizes—Mr. J. D. W. French, of North Andover, Mr. E. Pierson Beebe, of Falmouth, Mr. Thomas H. Lawrence, of Falmouth, and the widow of the late H. R. Hayward, of Lunenberg.

Mr. French entered for the prize for the best 1,000 White Ash trees. He planted 1,500 trees one to two feet high, in two lots. They were set in the sod four feet apart, and have received no care since they were planted. The first lot was planted upon a slope facing the west, in strong, rich soil. A slight depression in the lower end helped to retain the moisture and increase the value of the situation for the trees for which it was chosen. This piece of ground seems to have been well selected for Ash, both as regards soil and exposure. It contains 250 trees. The largest is twenty-five feet high, with a trunk, measured three feet from the ground, one foot in circumference, and the average height of the trees is eighteen feet. The second lot was planted on dry, gravelly upland, in an angle formed by the meeting of two public roads. The situation seems to have been badly selected, and the soil was not suitable for the Ash, which requires cool, moist land for good development. This lot contains 570 trees. The largest has attained a height of fourteen feet, with a trunk circumference of seven inches three feet from the ground, although the average height of the trees is only seven feet. Mr. French reports that the entire cost of the operation was $14.96 for the trees and for planting, and $30.20 for preparing the ground and for fencing, a total of $45.16, without interest. The conditions of the competition require 1,000 trees, and, although Mr. French's Ash trees are superior to any examined by your committee, it is of the opinion that as only 850 of the 1,500 trees now remain, he is not entitled to a prize.

Mr. E. Pierson Beebe entered for the prizes for the best 1,000 White Ash trees, and for the best acre of European Larch containing not less than 2,000 trees. 1,500 Ash trees were planted, at an entire cost, without interest, of $17.78. They were set in very light, gravelly soil, quite unsuited for this tree, and they have made little or no growth. They are not, in the opinion of your committee, deserving of a prize. The Larch were planted upon land of the same character, and have grown remarkably. The largest specimens are from twenty-five to thirty feet high, and in some places entirely cover the ground. 3,000 trees were planted at a total cost, without interest, of $60.90. This plantation, however, occupies less than one acre of ground, and there are only 732 trees now standing. Your committee is of the opinion, therefore, that Mr. Beebe has not complied with the conditions of the competition.

Mr. Thomas H. Lawrence entered for the prizes for the best acre of Scotch Pine raised from seed; for the best and for the second best 1,000 White Ash; for the best acre of European Larch, and for the best five acres of White Pine raised from seed. He reported in October, 1882, that the plantation of Scotch Pine had been a complete failure. Few of the seeds germinated, and the land was plowed up and laid down to grass. The Ash trees were set in soil entirely unsuited to this tree, and Mr. Lawrence does not now offer them for competition. The Larch were planted about a mile from the coast, in a slight depression on one of the low slopes which rise from the plain upon which the town of Falmouth is built. The situation is an exposed one, and the soil is light, very gravelly and almost devoid of humus. The trees, however, have made an admirable growth; many of them are more than twenty-five feet in height; they stand regularly and compactly and entirely shade the ground. The cost of this plantation is, without interest, $33.90. Your committee recommend that the prize of $100 for the best acre of European Larch be awarded to Mr. Lawrence.

The five acres upon which Mr. Lawrence sowed the seeds of the White Pine adjoin his Larch plantation, and is covered with the same quality of soil. The cost of the seed was ten dollars, and the cost of mowing the Blackberry vines, and bushes which partially occupied the ground, and planting the seed, was $13.95, making the total cost of the plantation $23.95. It was probably a mistake to mow the bushes, as they would have checked evaporation from the surface of the ground and would have served to protect the young seedlings. The seeds germinated badly, the dry season being unfavorable for them, and a considerable number of the plants which did come up perished from exposure and drought during the first season. Mr. Lawrence believes his partial failure is due to the poor quality of the seed, which he purchased at a Boston seed-store. As the seeds of American Pines usually sold in this country by regular dealers have been sent across the Atlantic twice, or are gathered from trees grown in Europe under unnatural conditions, it is not surprising that they fail sometimes to germinate or to produce vigorous plants.

There are, nevertheless, between two and three thousand healthy White Pines, averaging about four feet in height, growing upon the five acres. They do not stand regularly, however, and there are often large gaps between them; eventually, however, there will be trees enough to cover the ground. This plantation cannot be considered a success from the point of view of the number of trees raised, but it seems to be successful in demonstrating the possibility of growing White Pines cheaply, from seeds, upon land too sterile for agriculture or profitable pasturage.

These prizes were offered for the purpose of stimulating experiments which may be expected to increase the knowledge of arboriculture, and not for the purpose of increasing by a few acres, more or less, the number of trees in the state. Your committee is of the opinion that, considering the lesson that can be learned from Mr. Lawrence's experiment in sowing Pine seeds, it contains one of the most valuable of the results obtained by the competitions of 1877 and 1878, and they recommend that, in view of all the circumstances, the second prize in this class of $100 be awarded to him.

Mr. H. B. Hayward entered for prizes for the best 5,000 White Ash trees. His trees were planted in very light, gravelly soil, entirely unsuited to the Ash. They have made a very unsatisfactory growth, and are not, in the opinion of your committee, deserving of a prize.

Mr. French and Mr. Beebe would have received recommendations for prizes, except for their failure to present the full number of trees required by the conditions of the competition. They have done, however, everything in their power to further the ideas which led to this contest; their interest in tree-planting and the example which they have given by their plantations to the communities in which they live have been of service to the people of this state and its agricultural interests. Your committee is of the opinion that their efforts should receive some recognition from the Society, and they recommend that a suitable remembrance, not to cost in each case over $50.00, be sent to them, with a letter expressing the appreciation of the Board for their assistance.

Correspondence.

White Huckleberries.

To the Editor of Garden and Forest:

Sir.—The White Huckleberry, or the variety locally known by that name, is found growing in New Jersey in small, compact, isolated patches, upon the ridge of land running parallel with the Delaware River, and extending from Carpenter's Point to Wall-pack Bend.

The existence of this variety has been known here ever since the earliest settlement of the country by the whites. My attention was called to this berry by other boys, playmates of mine, fifty years ago. They generally kept their knowledge of such patches a secret, and though without especial value, they looked upon them as a great rarity, and prized them accordingly.

Geologically, it may be said that the Jersey ridge described is capped by "Canda Galli grit," a formation partaking largely of the elements of both the slaty shale on the Pennsylvania side of the river and the limestone on the other, and upon exposure to the elements it disintegrates readily, forming a calcareous loam of great natural fertility.

Since this ridge has been subjected to cultivation, wild fruits and berries of every kind have necessarily been swept away, and now can only be found where they have been suffered to exist in the woodlands that remain attached to the farms of this section. Occasionally, too, they may still be seen growing in bunches against a rock or large stump in an old field devoted exclusively to pasturage, where a lack of zeal in the use of the bush scythe upon the part of the owner has suffered them thus unwittingly to remain.

It is hardly necessary to state that the original forest growth was exceptionally heavy, which circumstance, a uniformly dense shade, added to soil, may have had much to do with originating this particular variety. I presume the birds and inferior animals may have distributed them somewhat after its character had once become fixed.

In flavor the berries are sweeter than the common black or the blue Huckleberries. I once saw a small quantity of them after they had been dried, and observed adhering to them white crystals of sugar. They are only white when grown and ripened in the shade. If partially exposed to the sun they will have a pink cheek. When exposed to the full rays of the sun, as in a field, they will be either pink or of a bright scarlet color. *B. A. Westbrook.*

Montague, N. J.

[Mr. Westbrook has kindly sent a plant of this white Huckleberry to the Arnold Arboretum. It is a variety of *Gaylussacia resinosa*.—Ed.]

Barberries.

To the Editor of Garden and Forest:

Sir.—Will you be so good as to tell me what are the "Barberries" referred to by Hazlitt in the following quotation, which he had seen and tasted when he was in America, from 1783 to 1787:

"The taste of Barberries which have hung out in the snow, during the severity of a North American winter, I have in my mouth still, after an interval of thirty years, for I have met with no other taste in all that time at all like it. It remains by itself, almost like the impression of a sixth sense."

Is the fruit of the North American *Berberis* (*Mahonia*) *Aquifolium* intended, which is often abundantly produced in English gardens and very beautiful, but, as I opine, very rarely eaten in Britain? Of course, I know that pleasing and lasting gustatory sensations are often the result of a traveler's or explorer's hunger and fatigue, or thirst, or other accidental circumstances, as was the case with the fruit of your *Rubus deliciosus*, which, eaten under ordinary circumstances, is generally considered a very poor sort of a Blackberry. I shall be glad, however, if any of your readers can corroborate Hazlitt as to the distinct flavor of frozen Barberries, whatever they may be. The bright red fruits of our native *B. vulgaris* are pickled and candied and used for garnishing venison, etc., but they do not seem to be much appreciated for their flavor.

Botanical Garden, Dublin, Ireland. *F. W. Burbidge.*

[Hazlitt's Barberries were the fruit of the common European *Berberis vulgaris*, which had become so firmly established in the Massachusetts colonies in the first century after the arrival of the pilgrims at Plymouth, that we find that the Province of Massachusetts passed on the 10th of June, 1764, "An act to prevent damage to English grain arising from Barberry bushes." It is a remarkable and interesting fact that the European Barberry, which even now is naturalized only near the coast of New England, mainly in Massachusetts, has failed to spread or gain a permanent foothold anywhere in the interior of this country, although it had almost at once established itself so firmly in one limited locality, that legislation seemed necessary in order to prevent it from injuring the farmers' grain. It has been suggested that the Barberry never did injure the Massachusetts grain crops to any appreciable extent, and that the law was passed on the strength of a popular belief brought from England that it was injurious to grain. "But if this is so," as Professor Gray once remarked, "we have a curious illustration of the precarious nature of testimony. For in Europe this colonial legislation has passed into history as independent evidence that the Barberry did damage grain in New England."

The Mahonia grows in a region several thousand miles from any part of America visited by Hazlitt, and was not known until the beginning of the present century, when Lewis and Clark crossed the continent to the north-west coast and discovered it on the banks of the Columbia River, in what is now the State of Oregon.—Ed.]

Recent Publications.

Notes on the Art of House-planning, by C. Francis Osborne, Architect. New York, Wm. T. Comstock, 1888.

The author of this little handbook is professor of architecture at Cornell University, and its pages, reprinted from *The Builder*, embody the substance of a portion of the notes he has used in instructing his classes. Much that he says is adapted to be of great service to young architects, and may profitably be studied by their clients as well, in order that they may have a more accurate idea than is usually manifested with regard to the exact nature of the result which they wish to see achieved by the architect whom they may employ. But as an elementary treatise on the art of house-planning in America the book has certain grave deficiencies. We are warned in the preface not to judge it for sins of omission, as it is to be followed by a second volume on the same subject. Nevertheless, we may complain if in the first volume of a work which deals with a subject that may be divided into separate topics for special discussion any of those topics are omitted with which a designer must concern himself, if at all, at the very outset of his task. To omit any of these is to give a false idea with regard to the spirit in which the task, as a whole, should be approached, as well as seriously to impair the value of a first volume while it is awaiting its successor. To illustrate our meaning, it may be said that while the consideration which should be given to "aspect" in planning a country house is by no means wholly neglected, a fuller treatment of the question is relegated to the volume still unborn, together with all discussion of the equally important and fundamental question of "prospect." But until the claims of aspect and prospect are thoroughly considered, no feature of a plan can be properly decided upon, and it would have been better to finish with this matter before beginning to discuss the relative claims of separate apartments. A still more serious blemish, however, is the omission to recognize the piazza as a feature of equal importance with any of the interior rooms. The author rightly remarks that the history of house-building is the history of civilization, and one might therefore

expect that he would perceive that the peculiarities of American civilization, as expressed in the tastes, habits, and physical and mental needs of our people, are nowhere so clearly revealed as in the importance which the covered piazza has assumed in our country homes of every size and class. The subject has been so recently discussed in these pages, that no further explanation of it is necessary here. We would merely state that although the veranda is once or twice incidentally mentioned in Mr. Osborne's pages, it is nowhere dwelt upon as an important feature, and still less is it recognized as a feature which should be considered in the very beginning with the greatest care as one upon the right arrangement of which the comfort of a country home is always very largely dependent, and one which, in many cases, may well have a controlling influence upon the arrangement of the whole interior. To plan the inside of a country house without distinct reference in every part to the position and extent of its piazzas, and then to add these as chance may allow—this is one of the grossest mistakes into which an American architect can fall; and it is one, therefore, which should have been guarded against in the very first chapter of a book like Mr. Osborne's. We should have been glad, again, had he said something of the need for considering the approaches to a house, and for consulting a landscape-architect—or, at least, consulting the principles of landscape-architecture—before even the station of the house and of its entrance are decided upon. Perhaps this very vital point will come up for discussion in his second volume; but it is one, we must say again, which might better have been explained at the beginning, since it must be understood and settled at the beginning, if at all, whenever the student commences actual construction.

Periodical Literature.

THE flower trade of London is estimated at £5,000 a day, and, as well as the trade in fresh fruits, is rapidly increasing, a fact which is held by Mr. Sampson Morgan, whose interesting paper upon 'Imported Flowers' has recently been issued by the Cobden Club as one of their 'Leaflets' to show "that there is improvement in a nation whose taste is changing in such a remarkable manner from drink to fruit, and from gaudy gildings to fragrant flowers."

From the same paper it appears that "between Nice and Cannes to London, especially during the winter and spring, there is a special railway and postal service by which the flower cultivators of France are enabled to pour into the English markets such things as White Lilac, Violets, Snowdrops, Lilies-of-the-Valley, Daffodils, Roses, Hyacinths and Fern by the thousand dozen bunches at the time; in fact, these consignments are at times prodigious. The growers of the Riviera and elsewhere in the south of France are now paying special attention to the culture of cut flowers for the English markets; and when we consider the tasty manner in which their consignments are got up, one can hardly be surprised that these goods have become so deservedly popular with English buyers. Many men might be mentioned whose names in our markets have almost become household words; but I would simply refer to M. Solignac, of Cannes, whose *champs-fleurs* (field-flowers) have for years past been so much sought after and bought up, especially by the London florist, and who, it is believed, disposes of various kinds of flowers, such as Roses, Carnations, Violets, Anemones and "Marguerites," annually, to the extent of £12,000, and in the face of this fact we can easily see that it must be a very profitable branch of trade. Of course his goods are well grown, and for some years during the "great run" on the "Yellow Marguerite," his consignments secured very high prices indeed. Further, Mr. Potter points out a fact that is totally ignored, even by men in the horticultural world, for although these flowers are called in France *Champs-fleurs*, yet they are always protected mostly with glass, and the ranges of these glass erections at Cannes, and especially on the hill-sides, is a sight worth seeing.

"The principal kinds of flowers imported to our markets, especially Covent Garden, from the Continent, etc., consist of Lilac and Syringa, Violets, both Parma and the Czar, and Mignonette and Lent Lilies, in enormous quantities, Mimosa or Acacia in two or three kinds, Narcissus in several varieties, including Paper White, Double Roman, Grand Monarque, Soleil d'Or, and the White Roman Hyacinth. All the above, if English grown, realize a better price in the market, but they are not grown in sufficient quantity in this country, and the Anglo-French salesmen in Covent Garden are now—during the winter, I might state, without hesitation—the most important venders in the market, and they are fully aware of their importance. Safrano Roses, too, are sent us in abundance, and Fern, the black Spleenwort, Asplenium and *Adiantum nigrum*, known as French Fern, are disposed of to the tune of some thousands of pounds. Orange blossom, too, is another imported article that fetches a large sum.

The following extracts taken from this instructive paper are of general interest:

"It is said that attar of Roses, manufactured in the Valley of Kesanlik, Roumelia, is exported to the value of £44,000; and some one has made a calculation to show that ten billions one hundred and four millions of blossoms are used each year at this one place alone. In connection with flower culture on the Continent, and now in the United States of America, the manufacture of perfumes from flowers forms a very profitable industry, and one which certainly might be adopted by the English grower. The town of Grasse, near Cannes, the capital of the department of the Alpes Maritimes, is the centre of a flower-growing district, and the principal seat of the manufacture of perfumes in France.

"It is stated that the famous attar of Roses is made from the *Rosa Damascena*, which grows like a weed in Smyrna, and in some parts of Turkey and France, though the growth is comparatively small in the latter country. The natives of these places collect this oil in a simple manner. The Roses are placed in water, and after decomposition sets in, the oil floats on the surface, and is absorbed by cotton balls deftly dipped into the liquid. The cotton under pressure gives up this oil, which is bottled and sealed. A bushel of flowers will produce only a few drops of oil. The genuine is the most expensive oil in the market and worth over £6 an ounce. It is adulterated with oil of rhodium, wax and other substances, and the price is arranged to suit the purchaser. The strength of this oil makes it sickening in its natural state. The adulteration has reached such a high state of perfection that even the most expert judges of perfumes are deceived by it.

"Patchouli is made from a natural plant growing in great abundance in the Malay Islands, and is a great favorite as a perfume. There is a growing demand now for lavender water. It is made by mixing Rose and Orange waters with the oil of lavender, and has a refined and pleasant as well as refreshing odor. The English oil of lavender is the best that is on the market, and besides being used as a perfume, is a favorite article in bakeries as a flavor for cakes and fancy products. It is a high stimulant and an efficient aid to digestion until the system becomes used to it, and then it is liable to breed one of the worst forms of dyspepsia. The Lavender shrub and the Jessamine plant are cultivated to a large extent in England and France for this industry. The genuine Heliotrope is not as fine an odor as the imitation. The latter is known as the White Heliotrope, and is made from a combination of violet and vanilla, and has a soporific tendency if breathed any length of time. Bergamot, with musk, forms the staple perfume of the colored."

It was not until the year 1652 that Coffee was introduced into London as an article of commerce and that the first Coffee house was opened by a Greek named Pasgua Rossie. For many years Arabia, where the Coffee plant had been introduced from Abyssinia, was the only country which produced it, but in 1696 the Governor-General of the Dutch East Indies procured a few of the seed and planted them in a garden at Batavia. The plants flourished and some were sent to Java, whence one went to the Botanic Garden in Amsterdam. From this plant seedlings were raised and sent to Suinam, where the cultivation of Coffee was established in 1718. Ten years later plants from the same source were sent to the West Indies, so that the offspring of the single plant which grew in the Amsterdam garden now produces, it is said, more Coffee than all the other plants in the world. These statements are taken from the fifth bulletin issued by the Botanical Department of Trinidad, which is devoted to "A Short Treatise on Coffee Cultivation," filled with practical instruction upon the cultivation of Coffee in the Island of Trinidad, including directions for selecting sites for plantations, clearing land, the formation of nurseries, planting, weeding, pruning, manuring, harvesting and curing the crop, with descriptions of the most improved machinery now used in preparing the berries for market. Half a dozen varieties of different origin of the Abyssinian plant (*Coffea Arabica*) are cultivated in the Trinidad Botanic Garden, as well as the species discovered a few years ago on the west coast of Africa and known as the Liberian Coffee (*C. Liberica*) and now widely disseminated in Coffee-growing countries. This plant flourishes in Trinidad and has already attained a height of thirty feet, producing large crops

of berries. Its great height, however, makes the collection of the fruit slow and expensive, and it is perhaps doubtful if it will ever really supplant the dwarf Abyssinian plant. This instructive and interesting report upon one of the most valuable industries of the West Indies is from the pen of Mr. J. H. Hart, F.L.S., long connected with the Botanical Department of Jamaica and now the energetic and successful head of that of Trinidad.

Notes.

The Colorado State Horticultural and Forestry Association will meet at Denver on the 10th instant.

December was so exceptionally mild in England that Snowdrops and Maréchal Neil Roses, Hepaticas and Christmas Roses were blooming together in gardens.

Mr. Henslow, at a recent meeting of the scientific committee of the Royal Horticultural Society, of London, called attention to the fact that the Dahlia was first introduced into England 100 years ago by the Marchioness of Bute.

The pretty little *Draba verna*, one of the earliest of spring flowers, was blooming holiday week in abundance in Germantown. The constant rains of late summer advanced the plants much more than usual, and it takes but a few warm days to bring them into bloom. It has been many a year since this flower could be gathered at Christmas.

In the Colorado State Agricultural College, theoretical and practical arboriculture form part of the regular course of study. Preparation has been made for the establishment of four experimental stations in as many different sections of the state, to be conducted in connection with the college, and special attention will be given to trees and tree-planting.

The Phylloxera has made its appearance at the very gates of Paris, having been detected recently in the grounds of the School of Agriculture at Grignon. The discovery naturally causes great excitement and alarm among the Grape-growers of Argenteuil, who derive an annual revenue of a million francs from their vineyards. They have petitioned the Minister of Agriculture to order the destruction of all the vines at the school.

It is stated upon good authority that in Germany the small holdings in land of two and a half acres and less exceed 1,000,000; of two and a half acres to twenty-five, 2,000,000; and while, in the whole kingdom, 14,000,000 acres are devoted to grass, 47,000,000 to vegetables and corn, over 64,000,000 are utilized for fruit and the productions of market gardens worked by the spade, in England there are to every five acres devoted to fruit over 1,000 devoted to root crops and corn.

The American Philosophical Society is printing the manuscript diary kept by the French botanist Michaux during his travels in America during the last century. It was presented to the Society more than sixty years ago, by his son, the younger Michaux, the author of the standard work upon American forest trees. This curious document, which covers the whole period of Michaux's residence in America, with the exception of the two first years, contains much information of interest to students of the habits and customs of the people of this country, especially of the inhabitants of the frontier settlements during the last century, as well as to botanists. The Journal is edited by Professor Sargent.

In the report made by Professor Beal upon his examination of the Jack Pine Plains of Michigan, he says: "In watching the rapid flow of the Au Sable and the Manistee passing by the plains which were thirsting for water, it often occurred to me, 'Why not turn the waters on the fields and make them fertile, instead of using them to float logs to the lakes?' A thing so easily done, I believe one day will be done—and done with great profit—not likely by those owning small farms, but by those owning land by townships and sections. If we could control the water on these plains, so they should not lack for it, we could grow good crops, and with good crops the soil would rapidly improve in fertility."

The following description of a singular freak of nature was recently printed in *The Garden*: A few days ago a friend was exploring a room in a dwelling house which appeared to have been unused for a long time, when he found a curiosity in the shape of a Potato plant which had sprung from a large Kidney Potato that was lying at the bottom of a damp cupboard. It had made no roots, but had thrown up several leafless stems which were perfectly white and had filled the lower compartment of the cupboard. From every joint of these stems, long white filaments were sent out, each of which bore several small tubers. In all, the Potatoes must number some hundreds, all grown from the same parent tuber.

An English correspondent of *The Garden* writes as follows with regard to the effect that the wet summer of 1888, followed by a very warm autumn, has had upon the foliage of Oaks: "Last year, growth was made early and became well ripened, and the leaves fell at the usual time. But this year the first growth of the Oaks was stripped of leaves by a plague of caterpillars. After the plague subsided a second growth, in some cases as much as nine inches in length, was made. This wood was quite soft when early frosts came in October and the leaves were perfectly green; but gradually the shoots have hardened, the leaves have colored, although they refuse to drop, and resist the force of strong November gales which have been recently sweeping over the country."

According to the Cairo correspondent of the London *Times* the arable area of Egypt has been almost quadrupled since the days of Mohammed Ali, half a century ago. An immense impulse was given during the reign of Ismail, when the War of the Rebellion in this country stimulated the cultivation of cotton in other lands; the cultivable area of Egypt then increased at the rate of 22,000 acres a year. During the last five years, when the English have administered the departments of Finance and Public Works, an almost equally rapid increase has taken place, and it is said that during 1888 no less than 75,000 acres will have been reclaimed. Irrigation is, of course, the expedient employed. When one stands on an elevated point in any part of the Nile Valley, a straight, clear line is described which separates the rich growing crops from stretches of white sand, as barren and hopeless-looking as the beaches of the sea. But this line merely marks the extent to which the waters of the river have been admitted at the time of their annual overflow; and it only needs that they shall be admitted further and stored by a simple system of little dams and canals, for the sand to become a soil of marvelous fertility. A certain verse in the Bible speaks of the laborer as "watering the ground with his foot"; and the persistence of Eastern customs is revealed by the fact that to-day this process may be seen in execution. The fields in many districts are cut into rectangular squares, between which run little canals, their banks formed by low ridges of earth. At due intervals the cultivator goes from one to another, pressing down a bit of the ridge with his foot, letting the water overflow the square, and then closing the aperture in the same manner. The arable area of Egypt is now 4,885,968 acres, as against 1,856,000 estimated for the year 1833.

A correspondent of the *Gartenflora*, writing from Caracas, in South America, tells of the recent development of horticulture in that country. Twenty-five years ago, he says, the art was almost unknown; no public parks or gardens existed, and private cultivators made but a sorry showing with a few species of common garden flowers and native plants grown, very often, in broken pots and boxes. The first impulse toward improvement was given by a German botanist, Moritz, who laid out a charming garden for a German colony at Tovar and introduced many unfamiliar plants, among them the Gladiolus. His efforts were followed by those of a fellow-countryman, Herr Hahn, who formed a beautiful Rose garden near Caracas, and then by those of General Guzman Blanco, who established the first public park, and turned the squares of Caracas—formerly mere stone-covered or weed-grown spaces—into charming gardens. A French gardener was imported, who, in addition to his other enterpises, succeeded in the difficult task of making beautiful lawns in this hot, dry climate. The principal park is now called "Pazeo Guzman Blanco," and adorns a hillside near the city which was formerly a sterile expanse of red-brown earth. Now it is terraced and planted with fine groups of trees, shrubs and flowers—various species of Ficus and Cassia being conspicuous—and among them large clumps of a tree-like Grass (Guadua) and of broad-leaved *Aroideæ*. Among the native shrubs, the writer notes as most beautiful, *Duranta Plumieri*, which has a compact growth and evergreen foliage, and bears its violet-blue flowers and profuse yellow-red fruit together. Araucarias have been largely planted, and while *A. imbricata* does not do well, *A. Bidwelli* flourishes and *A. excelsa* seems likely to succeed. Fortunately, adds our author, only a single formal bed can be seen in this park. Private citizens have had their ambition excited by the success of the park, and many of them can now show delightful gardens for which they import plants from Belgium and England.